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Some Pig Diseases*

by

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Most of the pathological conditions we find in pigs are of a "local" character, affecting certain organs and thereby setting in motion a certain train of symptoms. Looking at the incidence of disease in pigs at the time of slaughter, *i.e.*, in apparently healthy stock accepted by the factories for bacon production, prior to the war, the diseases most frequently encountered were tuberculosis, pleurisy and pneumonia, hydronephrosis and nephritis, pericarditis, peritonitis. The lungs, kidneys, liver, heart and intestines are the internal organs most likely to show pathological lesions, and in the order mentioned.

Apart from tuberculosis, the other constitutional ailment frequently found is swine erysipelas, with an occasional case of swine fever and swine paratyphoid. In the bacon factory pig, swine fever is more often found in sow carcases, and either that disease or tuberculosis is suspected whenever a fairly aged, and rather emaciated, sow forms part of a pig consignment.

On the farm, chills and pneumonia, *Ascarides* infestation and erysipelas, with dietetic and deficiency conditions, are those most often found in these post-war days. Previous to the war the picture was slightly different. Then the deficiency diseases loomed large, due to the chronic overcrowding of pig farms. Producers were so anxious to turn out the finished product for the factories in record time, that early maturity and concentrated feeding had reached a stage which almost suggested that the pig was a mere pork- or bacon-producing machine, devoid of any complex physiological mechanism. Conditions were such that scour, anaemia, swine paratyphoid or bacterial necrosis and avitaminosis were chronic throughout most of the larger pig farms. The war came, with its drastic cuts in the pig population owing to a lack of imported foods. So the number of pigs kept per acre was reduced to such an extent that it became possible once more to move pigs on to fresh ground instead of keeping them crowded on pig-sick land. The early maturity craze had to be abandoned. All these changes had a beneficial effect upon the general health of pigs. The incidence of scour, anaemia, paratyphoid and the other deficiency diseases is now much lower than it was in pre-war years.

When the time comes for an expansion of the pig population we must be prepared for an increase in the diseases I have mentioned, and it is to be hoped that the newer medicaments such as the sulpha drugs, penicillin, and the swine fever vaccine will be in plentiful supply by that time.

The cottager's pig normally gets along much better. Here the chances of infection are lower with one or two pigs in a lone sty, whilst the care and attention lavished upon the animal ensures its safe arrival at pork or bacon weight.

As regards tuberculosis, the comparatively early age at which pigs are slaughtered causes this disease to pass unsuspected. The best method of attack against tuberculosis in the pig is to clean up our dairy herds and poultry flocks.

Swine erysipelas seems a fairly constantly recurring disease, in spite of sera and vaccines. This is not unexpected in view of the fact that the casual organism can be present in apparently healthy swine, and in the soil. The practice of pig breeders of doping their pigs with poor quality serum, without veterinary advice, may be beneficial to the manufacturers of such serum, but it makes no contribution to the eradication of the disease from our pig herds. The diamond-shaped, raised purple markings on the skin have long been regarded as characteristic of this condition, but even these markings are not always easily visible in the live animal. Many cases, and some of the most acute and dangerous ones, show no visible markings on the skin of the animal during life. Often the only history is one of refusal of food, and disinclination to move about. The heart lesion, a verrucose endocarditis, is more likely to be associated with those cases where there is a diffuse reddening of the skin over the withers, rather than cases showing the typical diamond markings. In chronic cases the only lesion present is that of the heart valve. Many cases of arthritis or so-called rheumatism in pigs are apparently due to swine erysipelas.

In some of these chronic cases of arthritis the animal is emaciated, and the legs appear longer than usual. This is an illusion due to the lack of good round ham muscles. The stifle, hock and fetlock joints are enlarged. Bony swellings may be found on the matatarsal and metacarpal bones. The hind legs seem to be more often affected than the fore legs, and in such cases at a *post-mortem* examination the iliac lymphatic glands will be found enlarged and of a brown colour.

There is another kind of arthritis seen in black pigs, and which is of a more acute type. It is rather sudden in its onset, and attacks young animals between three to six months old in particular. It affects pigs kept under ideal conditions as regards environment and feeding. The hind legs are usually affected, and the stifle joint in particular. The joint becomes swollen and painful. The use of large doses of swine erysipelas serum does not have such beneficial effects on this condition as the administration of sulphapyridine, which rather points to the condition not being associated with erysipelas. Acetyl-salicylic acid appears to exert even more beneficial results than the sulpha drugs in this condition, which seems to be more in the nature of an acute pig rheumatism than anything else.

Swine fever is, of course, still with us. It must be fairly obvious to the authorities by this time that many swine fever cases are never reported to the veterinary surgeon by the pig owners. Take, for example, the many thousands of pigs that normally pass through the British bacon factories every year. As a rule a farmer would not send a pig in for pork or bacon unless the animal was apparently healthy and fit for slaughter, but it stands to reason that over a number of months or years there must be some cases of this disease passing into our abattoirs, with lesions sufficiently visible to make identification and notification possible. It would be interesting if we could be told what happens in many factories which have no veterinary inspection whatsoever.

Even under the ideal *post-mortem* conditions of a factory abattoir the diagnosis of swine fever is not an easy matter. The difficulties are enhanced when dealing with an animal that has been dead for some hours or even days, during the hot weather. The carcase is green in colour, extensively blown, and all internal organs have undergone *post-mortem* changes, and all the time we are searching for a septicaemic type of disease complicated by infection with secondary invaders!

Of course the history, if available, helps us; also such factors as diarrhoea and general unthriftiness amongst the herd or the presence of some razor-backed old sow. One looks for purplish discolouration of the skin, especially about the ears and shoulders, even down the back of the hams, and petechial haemorrhages into the skin. Often the colour of the pig, long bristles, or dirt may obscure these lesions. A little boiling water thrown over a portion of skin, and the scraping off of all hair with a knife, may help to reveal otherwise hidden lesions of this nature. Small circular sores on the "trotters" (metacarpal and metatarsal regions), varying in size from that of the silver threepenny bit to that of a sixpenny piece, are often present in swine fever. In many cases these may be the only visible skin lesions, and before going on to talk of the internal pathological changes, it is as well to mention that the skin lesions described, apart from the leg sores, may be present in swine paratyphoid, but it is extremely rare for that disease to appear in adult sows or boars. Again the skin lesions in paratyphoid are generally petechial rather than diffuse, except along the ears. The leg sores may be confused with lesions of swine-pox, but here again the pox sores may be found also on the body of the pig.

As I mentioned before, we are dealing with a septicaemia, and the skin lesions mentioned, apart from the leg sores, are fairly constant in any septicaemic condition found in pigs. Thus it is no more use trying to diagnose swine fever on skin lesions alone, than it is to confine oneself to the bowel ulcer method of diagnosis. To a body of veterinary practitioners one need not stress the impossibility of diagnosing any disease from one angle.

Internally we have pneumonic lesions, which are secondary, and may also be present in other pig diseases besides swine fever. Other lesions are a cranial hyperaemia, haemorrhages on the epiglottis, kidneys, and peritoneum. There is dark or black colouration of the faeces, and an almost black colour of the carcase

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lymphatic glands (in the early stages it is the gland cortex that is usually congested with blood). The heart, stomach and bladder will show extravasations of blood, as will the bowel on its outer and inner aspects. The diphtheritic yellow film covering the intestinal mucous membrane is not so characteristic of swine fever as of paratyphoid.

The well-known button ulcer lesion is usually confined to the region of the caecum. Whereas in paratyphoid it is shallower and has a distinct line of demarcation around it, in paratyphoid we seldom get the distinctly black faecal contents.

The spleen infarcts are regarded by some continental authorities as diagnostic of swine fever. Others swear by the ulcers, others the kidney haemorrhages, bladder haemorrhages, encephalitis, and so on, each backing his own fancy as it were, and generally forgetting that the condition we are dealing with is septicaemic.

The nearest disease to swine fever, from the point of view of symptoms and lesions, is swine paratyphoid or necrotic enteritis, that other disease of overcrowding and faulty feeding. In general I find that both diseases represent a septicaemia, but that paratyphoid seems to show "milder" symptoms than swine fever. The skin lesions in paratyphoid are not so pronounced. It is usually frequent in winter and, except on badly managed farms, is not present all the year round. Faecal contents of the bowel are yellow rather than black in colour. The skin sores on the legs are absent in paratyphoid. The lymphatic glands are not so intensely congested and black in appearance as in swine fever. Kidney haemorrhages may be absent in paratyphoid.

As regards treatment, better hygiene on pig farms, more stringent reporting of cases, and the use of crystal-violet vaccine will, we hope, lead to this disease coming well under control here, but I must again stress that to allow thousands of pigs to pass from breeder to butcher every year, without any veterinary inspection, seems to leave a big and constant gap in our defences against this disease.

I have mentioned swine-pox lesions. These are usually found in very young pigs, adults being seldom affected. The variola lesions may occur on any part of the body, and the condition is infectious. Predisposing causes of the disease are faulty feeding, and keeping pigs in insanitary surroundings. Affected animals are best slaughtered off, and contacts vaccinated with a swine- or cow-pox vaccine.

Pneumonia and influenza are fairly common conditions encountered in pigs, especially where there is any intensive rearing, or any tendency to overcrowding in Scandinavian type pig houses. Thanks to the discovery of M. & B. 693 this condition is no longer so troublesome to treat as was formerly the case. Associated with pneumonia one gets swine influenza and piglet influenza, the two latter being virus diseases. In these latter diseases arthritis may be a prominent symptom, in addition to those set up by the condition of the lungs. Sulphapyridine is a most useful drug to use in these influenzas, but one must not overlook the predisposing cause. Draughty overcrowded houses, pig-sick land, lack of green fodder, and the usual conditions one associates with avitaminosis, as well as mineral deficiency, are often present on farms where these diseases seem to thrive.

The minerals most likely to cause trouble when absent from the food are iron, copper, calcium, magnesium, phosphorus and iodine. We may group mineral deficiency with vitamin deficiency, as leading to a trail of symptoms in pigs. It is usually the young piglet who suffers first, and we get first the very clean, pale-skinned young sucking pig, very anaemic, next becoming emaciated and dirty when "scour" appears. In mineral deficiency the pig soon becomes razor backed, with lumps about the size of a walnut appearing all over the body—these are usually abscesses. In acute cases a pig six months old will appear no bigger than a weaner of eight weeks, from a healthy litter. In other cases you may get no razor-backed pigs, but instead, symptoms of scour, and even dysentery, with conjunctivitis, and discolouration of the ear tips, leading to an attack of swine paratyphoid, or necrotic enteritis. So it is that we get our pig scours, piglet anaemias, necrotic enteritis, erysipelas and swine fever, all traceable to some fundamental deficiency in the environment or feeding of the animal.

Feeding with iron mixtures is only palliative, and better results are obtained by preventive measures.

Such measures should include the avoidance of overcrowding, removal of sow and litter to fresh pastures, ploughing up of old pig-sick land, and cropping thereupon. The feeding of a green supplement, cod-liver oil or halibut-liver oil to the sow prior to farrowing all helps to prevent these conditions. The sow should not be allowed to get too fat before farrowing. It is not always the rather emaciated looking sows who give the anaemic pigs; in fact, the reverse is usually the case.

Pig mange is another complication of an unthrifty pig reared in insanitary surroundings. So also are worm parasites. It is always best to worm young pigs as a routine measure after weaning and just as the fattening up process is being started. Chenopodium in castor oil is a good mixture. Santonin can also be used, but phenothiazine should be used with caution.

There are dozens of other conditions occasionally found in our pigs, but I am afraid that it is impossible to mention any more of immediate importance in the time at my disposal. I can only hope that those I have mentioned will provide you with material for an interesting discussion.

Opening of Discussion

The discussion was opened by Dr. N. S. Barron, as follows: Naturally, one would have liked to hear something about a number of other diseases not dealt with in Mr. Anthony's paper, but as his concluding remarks indicate, any further additions would make the paper too long and perhaps too weighty. Though Mr. Anthony's daily experience constitutes very largely what might be called a "dead-end" job, we know the author as a man of wide knowledge of pig diseases, and one whose interests have led him not only to study the health and happiness of pigs in their various living quarters but also to commit himself, inevitably in book form. We are indeed fortunate to have someone with us to-day before whom we can place our personal problems concerning pig diseases.

I would like first to discuss some points raised by his paper, and then to refer to some diseases which he saw fit not to mention. I was interested in the reference to the use of cow-pox vaccine for the control of swine-pox. As this disease seems very rare and of no great economic importance I would like to ask the author of the paper when it is economically worth while to use it. In this connection it rather surprises me that vaccine made from a cow-pox strain should have an immunizing effect in cases of swine-pox.

In his reference to the treatment of ascarids the use of phenothiazine is referred to with caution. I should like further information on this point, as I had the impression that this drug was more effective and safer than the accepted standard treatment of chenopodium in oil.

Although in general there is very little to which one could take exception in the paper which has just been read, the one remark with which I disagree is that in connection with the great number of cases of deficiency diseases met with *prior* to the war and explained on the grounds of overcrowding. I can only suggest that the deficiency was a gross one in that some pigs failed to get their total quantity of food. It has been my experience that there has been a *higher* proportion of disturbances due to dietary deficiencies in the pig industry during the war, than was the case previously. Though overcrowding disappeared quickly, the exigencies of war necessitated the feeding of a great variety of foodstuffs, hitherto little used, or at least, little understood. With the enormous increase in swill feeding, a procedure not widely used before the war but mostly confined to villagers' pigs and piggeries on the outskirts of big towns, many problems arose. Swill, itself, is not suited for young pigs. It may show a fluctuating protein content, an excess of fibre, a deficiency of minerals and a complete absence of such vitamins as A and D. All these factors must be taken into account when assessing the value of swill and investigating the cause of sickness occurring where it is widely used.

Let us look at these fractions separately. When swill is steamed, the fat rises to the surface. Fortunately, it is skimmed off as a routine measure by the pigman; thus interference from an excess of this material seldom is encountered. If left, the fat is apt to depress appetite. The fibre content may be altogether too high in a poor quality swill or pudding, which is after all the same material as swill but subjected to pressure cooking. Minerals, even the common ones such as calcium and phosphorus, are often low and inadequate, especially for the rapidly growing pig. The diet should be appropriately fortified with a complete mineral supplement. Vitamin A is low as a rule, especially if there is little greenstuff present and that of poor quality. In this connection, it is interesting to note that the pig generally lives on a remarkably low level of vitamin A intake, especially when kept intensively. Symptoms of a deficiency are generally chronic and revealed in the form of widespread pneumonia, affecting the entire lung, deranged vision, disturbed gait, etc., but there is one form of the deficiency or suspected vitamin A deficiency, to which I would like to draw your attention, and that is the type associated with violent convulsions, frothing at the mouth, exhaustion and death in a proportion of cases. Some animals do recover after throwing fits, and the outbreak ceases suddenly. *Post-mortem* changes are not characteristic, consisting mainly of increased pericardial fluid and a varying degree of congestion of the large intestine. The method of management may result in a deficiency of vitamin A under other systems than when swill alone is fed, and in order to ensure an adequate supply of this vitamin it is quite sufficient to give half a pint of good quality cod-liver oil to store pigs of about three months old. This amount is sufficient to permit normal

growth until the time of slaughter. The vitamin is, of course, stored very largely in the liver and liberated as required. Swill is altogether deficient in vitamin D but its absence is frequently masked by automatic exposure to sunlight, and rickets does not develop. On the other hand, crampiness and painful joints are very common in pigs, and may be a reflection of a low vitamin D reserve. Whilst on the question of lameness, I should like to mention staphylococcal infection of the joints. Frequently swine erysipelas is suspected or diet incriminated and my impression is that this type of bacterial infection is apt to be overlooked. It clears up fairly quickly with sulphathiazine—up to three doses of 15 grammes for a ten-score pig. The stifle joint is commonly involved and contains pus, the staphylococci being present in very small numbers. I wonder if this is the so-called "black pig" disease to which Mr. Anthony refers?

Other disturbances in diet have been produced as a result of a too liberal addition of cocoa meal waste to the ration or of too much yeast. The cocoa meal is generally made from the bean after extraction for manufacturing purposes, and has a high percentage of the shell in addition. The protein content, generally low, is apt to vary, but the vitamin D content is strikingly high, which may have been the reason why the material was used in the first place. It contains also a very active principle, theobromine. If added in anything more than a small percentage to the ration, it seriously retards appetite owing to its very bitter taste, and the theobromine may cause death. Yeast, though an excellent foodstuff containing phosphorus, calcium, some factors of the vitamin B complex, vitamin E and available protein, is apt to upset the calcium-phosphorus balance, owing to its high content of the latter. Symptoms resembling rickets are produced, possibly due to a disturbance of the calcium phosphorus ratio. It is also said that yeast interferes with the absorption of vitamin A from the diet. As to the vitamin B complex, a condition in which the characteristic symptom is described as "goose-stepping" has been recorded and is attributed to a deficiency of pantothenic acid. We also know of the association of nicotinic acid with the digestive tract of the pig and its close relationship to paratyphoid infection. In this respect, I should like to ask Mr. Anthony whether he regards paratyphoid or necrotic enteritis as directly due to paratyphoid organisms, or whether he considers that a dietary deficiency is the primary factor.

Mr. Anthony has referred at some length to swine fever, a disease which all of us meet in many different guises. He has stressed the great importance of taking all factors into account when arriving at a diagnosis, and not merely pinning one's faith to petechiae on the kidneys or the larynx or to infarcts on the spleen. The natural alarm and tendency to diagnose swine fever when pigs are dying and before characteristic signs are observed is quite understandable, and it often takes a brave man to hold out in face of the available evidence, though this may not justify even a suspicion of the disease. Whilst on the question of swine fever, I would like to refer to the problem of the so-called "carrier" sow, mentioned in the paper. It is still a mute point as to whether there are such things as true "carriers" in virus diseases, *i.e.*, individuals in which the virulent virus is to be found in the absence of any clinical symptoms. We may perhaps avoid the problem by regarding the razor-backed old sow as a chronic case of the disease.

There are two diseases about which I should like to hear more from Mr. Anthony. Firstly, I should like to ask him how many cases of anthrax he has encountered, as to the identity of which he has been satisfied. Have the cases been sporadic and confined to individual animals, or did a number die together? What does he consider as the characteristic *post-mortem* lesion? I know his answer is expressed in his book, but I would like the matter raised here also for our mutual benefit. Secondly, although in American literature one sees frequent references to a disease described as swine dysentery, it has not been recorded in this country. The faeces are chocolate- or blood-coloured and like thick cream in consistency. There is a high temperature, high skin colouration and prostration. *Post-mortem* examination reveals a marked enteritis, sometimes the stomach being involved also, and the large bowel frequently contains casts of semi-solid material, with browny or pink, blood-stained contents. My own personal experience leads me to believe that cases occur not infrequently in this country, and are diagnosed variously as either anthrax or swine fever. The disease appears to be partly nutritional in origin but can be reproduced by feeding faeces of an affected pig direct to a healthy individual. Sulphaguanidine is beneficial in this condition.

Speaking generally I should say that there is no other animal that presents to the veterinary surgeon more difficult problems of diagnosis. Symptoms are frequently exaggerated and apt to be misleading as the disease has a habit of not always declaring itself at the first visit, nor even after subsequent ones. The initial diagnosis must quite clearly be given with great caution in most cases. The pig also seems to be much more suscentible to variations in the environment in which it is born and reared, than any of the other domestic animals. Many examples of this could be quoted, such as the appearance of swine erysipelas under quite clearly defined, warm, humid weather conditions. The association of the housing with outbreaks of influenza and the influence of methods of management upon ascariasis, necrotic enteritis, scours, and anaemia are well known. Though I do not for a moment suggest that research into the fundamental bacterial and virus causes of diseases in the pig should be relaxed, I do feel that we shall derive greater benefit from an exploration of the effects of local conditions, such as light, temperature, moisture, soil, etc., upon the life of the pig. In practice the veterinarian can be of best service to the pig industry by having a comprehensive knowledge of the different methods of pig management and being able, in the first instance, to recommend the most suitable methods to employ.

The Interference Phenomenon in Relation to Immunization Against Distemper and Other Virus Diseases*

by

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We are all familiar with the classical process of immunization in which the injection of an antigen is followed, after an interval, by the development of antibodies which can be demonstrated in the circulating blood and which can be collected in the serum and used for the purpose of transferring a passive immunity to another animal. During recent years a number of articles have been published dealing with a type of resistance to infection which differs very markedly from the classical immunity. The important difference is that resistance is developed very rapidly, so rapidly that it cannot be explained on the basis of the manufacture of antibodies, and in fact no antibodies can at that time be demonstrated in the circulating blood.

Various terms have been used to describe this new type of resistance to infection, such as "cell-blockage," "pre-emptive immunity," and "the interference phenomenon". The phenomenon is apparently of a fundamental nature. It has been demonstrated in connection with virus infections of plants as well as of animals and also in connection with bacteriophages which are essentially viruses attacking bacteria: it has not been encountered, so far as I know, in bacterial infections. Something similar has been observed with some chemotherapeutic agents.

The first records of this condition were in connection with plant virus infections. McKinney in 1929 had recorded that a plant infected with a certain mild strain of tobacco mosaic disease was resistant to infection with another virulent strain. In 1931, Thung, working in the Dutch East Indies on a virus disease of the tobacco plant, had two related strains of virus. One was a virulent strain and produced green spots on the leaves of the plant: the other was less virulent and produced yellow spots. He found that when the two strains were inoculated simultaneously into a plant both yellow and green spots developed on the leaves. The interesting point was that the yellow spots contained only the mild virus and the green spots only the virulent one. In any one lesion there was no mixing of the viruses. There seemed to be a mutually exclusive action so that the plant cells attacked by one virus were impervious to attack by the other. In 1933, Salaman, working with a virus disease of potatoes, described similar findings and showed that under certain conditions the inoculation of a plant with a mild virus would protect it against a more virulent strain inoculated at the same time or shortly afterwards. Many other examples have been found in the field of plant virus diseases and much work has been done on the subject.

The first mention of the condition in animal virus infections was in 1935, almost simultaneously, but independently, by Magrassi in Italy and Hoskins in America. Hoskins was working with the yellow fever virus of which he had viscerotropic and neurotropic strains. The viscerotropic strain inoculated into monkeys caused high mortality with lesions in the visceral organs. The neurotropic strain was almost avirulent when inoculated by any route other than the intra-cerebral. Hoskins showed that if the neurotropic virus was inoculated subcutaneously or intraperitoneally into a monkey either before, simultaneously with or shortly after the viscerotropic, the monkey was protected against the lethal effects of the virulent

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viscerotropic virus. In 1937, Findlay & McCallum confirmed this work and also showed that the virus of Rift Valley fever protected monkeys against a virulent viscerotropic yellow fever virus.

Magrassi worked with the herpes virus, some strains of which could cause encephalitis in rabbits while others could not. Rabbits could be protected against an encephalitic strain by simultaneous inoculation with a non-encephalitic strain.

Dalldorf, Douglas & Robinson in 1938 showed that Rhesus monkeys could be infected experimentally with the distemper virus. The disease closely resembled distemper in dogs but the mortality was low; during the course of a distemper infection the monkeys were resistant to infection with a poliomyelitis virus which was very virulent for normal healthy monkeys. Monkeys infected with distemper were not, however, protected against the virus of equine encephalomyelitis.

In 1942, Jungblutt & Sanders showed that a murine strain of poliomyelitis virus could protect monkeys against three different virulent strains of monkey poliomyelitis virus. They also showed that under certain conditions the mild murine virus actually had a curative effect when injected into monkeys infected with the virulent strains. The conditions for success depended upon (*a*) the size of the infecting dose of the virulent virus; (*b*) the amount of the mild murine virus given and (*c*) the time interval between the two injections.

Andrews, in 1942, showed that the phenomenon could be demonstrated in tissue cultures in which influenza virus of various strains was cultivated. White, in 1937, and Delbruck & Luria, in 1942, showed that a feeble lytic bacteriophage could protect bacteria against a strong lytic phage. Many other examples could be cited, but time will not permit.

These findings have been the cause of lively speculation as to the possible mechanism by which the effect is produced. All the known examples concern viruses or bacteriophages. These have in common that they are obligatory intracellular parasites and to produce their effects they must first penetrate into the cells of the host. In this they differ from the bacteria which can damage the cell from outside. As I have said earlier, when a bacterial vaccine is injected into an animal a time interval must elapse before immunity is developed and during that interval the negative phase occurs during which the vaccinated animal may be more susceptible to natural infection. In the examples of the interference phenomenon which I have quoted there is nothing resembling a negative phase. The resistance to infection follows very rapidly, almost immediately, on the injection of the "mild" virus and indeed in some cases an immediate curative effect has been recorded. An explanation which has been advanced is along these lines. Before it can produce disease the virus particle must penetrate into the cell. The penetration is pictured as something resembling a chemical combination. The cell may have certain "links" and only a virus with a corresponding "link" can attack that particular type of cell. Once the "link" on the cell has been occupied by a virus particle it is no longer available to another virus particle. The cell has been "blocked" against that virus or any other virus with similar "links." The situation is something analogous to a key and a lock. The appropriate key can open the lock; but so long as it remains in the lock no other key can do so.

I come now to diseases in which this interference phenomenon may possibly play some part in the processes of immunization in every day use. In small-pox immunization the vaccine used is essentially a strain of the small-pox virus which has been modified by passage through the calf. It is accepted practice to vaccinate people who have been in close contact with infection and some of whom are doubtless in the incubative stage of the disease. Experience has shown that this is a useful procedure and that provided the incubative stage is not too far advanced, the chances of successful prevention or at least mitigation of the disease are very good.

Again, in rabies the vaccine is a virus modified by passage through rabbits. It is used on people and animals which have been bitten by rabid dogs—a considerable proportion of them doubtless definitely infected. Provided too long an interval has not elapsed between the infecting bite and the injection of the vaccine the chances of success are good.

A theory which I have heard advanced in the past to explain these successful results in small-pox and in rabies is that in both cases the adaptation of the virus has shortened the incubation period as compared with the natural virulent virus. As a result the antibodies to the vaccine are developed more rapidly and so neutralize the slower developing virulent virus. Is it not possible that the facts might better be explained by the interference phenomenon?

In the more purely veterinary field we seem to have at least two examples.

I. T. Edwards introduced goat-adapted virus as a means of immunization against rinderpest in cattle. At first, a dose of immune serum was given along with the living goat virus. Later he showed that repeated passage through goats had so modified the virus for cattle that it could be used with safety, in certain resistant breeds, without the simultaneous dose of serum. Pfaff reported in Burma in 1939 that resistance to infection could be demonstrated as early as 24 hours after injection of the living goat virus. That was a revolutionary finding, as with all other known methods of immunization a period of about ten days was necessary before any useful resistance was developed. Pfaff, in reporting his findings, did not mention the interference phenomenon and possibly at that time he did not know of it, but such an early development of resistance seems to be an example of this phenomenon.

The next example arises out of Green's work in America on the immunization of foxes and dogs against distemper with what he has called distemperoid vaccine.

Much of the success which attended Dunkin & Laidlaw's investigations into distemper depended upon the finding that ferrets could be infected with the distemper virus. Green conceived the idea that if the distemper was to be repeatedly passed through ferrets it might become modified or altered to such a degree as to become avirulent for foxes or dogs and if that could be achieved the modified virus should be an excellent agent for immunizing these animals. His work started in 1935 and a full account was published in 1945 in the *American Journal of Hygiene*. He started with two viruses: one had been isolated from a fox and the other was Dunkin & Laidlaw's strain of the distemper virus. Later, when he satisfied himself that all the fox strains which he had isolated were immunologically identical with the Dunkin & Laidlaw's strain, he discarded the fox strain and used only Dunkin & Laidlaw's. I mention this because I have heard it stated that his starting point was a fox strain. With this strain, passed from ferret to ferret, he had obtained, by the 39th passage, evidence of attenuated virulence for foxes. The passages were continued, though interrupted by two serious setbacks caused by his strain becoming contaminated accidently by natural virus. By the 54th passage the virulence for foxes was so low that the naked virus was used in a field trial on 4,000 fox pups. The dose of virus was 0·5 c.c. of a 0·5 per cent. suspension of fresh ferret spleen. The mortality on exposure to infection with distemper was one per cent. while in a non-vaccinated group it was 75 per cent. In a further trial on 18,000 foxes on an infected fox ranch the mortality was 0·2 per cent. Trials were then made with doses varying from 0·5 to 5 c.c. of spleen emulsion and the reactions to the large doses were mild and did not cause any mortality. He then tried the vaccine on dogs, using doses up to 250 mg. of spleen tissue. Reactions were mild and a very strong immunity was developed.

In a later paper Green has claimed that this ferret-adapted strain of virus can be used to immunize healthy foxes and dogs, that it can be given with safety to direct contacts in infected kennels, that when so used it rapidly brings to a halt an outbreak of the disease and further that it has a curative effect when injected intramuscularly in large doses into dogs showing early clinical symptoms of distemper. He describes experiments in which dogs were infected with virulent distemper virus by intranasal instillation. Later, when they had developed fever and ocular discharge, they were given intramuscular injections of large doses of the ferret-adapted virus. Green claims that he obtained a high percentage of cures. He also describes experiments to show that his ferret-adapted virus will protect dogs against simultaneous injection of virulent virus.

He explains these findings by reference to the interference phenomenon. Their importance, if confirmed, needs no emphasis by me. I have tried to cover a big field in a short time. Many omissions, especially details of Green's work, have been necessary. I fear that over simplification may have obscured some aspects of the subject. For that I crave your indulgence.

Discussion

Mr. R. C. U. Fisher asked for more information on the mechanism of immunity production. When both the field virus and the interfering virus are given together, in what way does the second take precedence over the first?

Secondly, Green attenuated the virus of distemper by passage through ferrets which are very susceptible animals; could he not have used a less susceptible animal and so obtained greater attenuation?

Dr. W. M. Henderson: Mr. Crawford made an apology for certain omissions in his review but he had covered the ground so thoroughly that there was little room left for amplification. Recently another example of the "interference" phenomenon had been reported in connection with rinderpest by Shope and his co-workers. During the war the Canadian and United States governments started an experimental station for the study of rinderpest on an island off the eastern coast of Canada. During the course of this work Shope and his team successfully adapted a bovine strain of rinderpest virus to the hen egg and produced, by means of yolk sac passage, an attenu-

ated strain which, used as a vaccine, might well replace the goat virus vaccine. They found that with this avianized vaccine antibodies were developed in the normal course of about a week or ten days, but a beast vaccinated with avianized virus was insusceptible to a dose of virulent bovine virus soon after vaccination—a similar experience to that recorded by Pfaff with goat-adapted virus.

Green's work with ferret-adapted distemper virus was of great interest, especially his claim that the strain attenuated for the dog could be used curatively following infection with the virulent strain even after a lapse of some days. It suggested that the working hypothesis already outlined by Mr. Crawford in explanation of the interference phenomenon might have to be revised to fit in with this latest finding. If it was desired to import Green's ferret strain, and there was some doubt as to survival of the virus in stored material, it should be possible to get the strain to this country by importation of inoculated ferrets from which the virus could be recovered and maintained by our workers. He believed such a procedure had recently been used for the transmission of an infectious agent from America to Europe.

Miss J. O. Joshua: Mr. Crawford had apologized for the brevity of his contribution, but for her part she felt that its very conciseness had enabled her to get some grasp of what might have been a very abstruse subject.

She could, of course, say nothing of the scientific aspect of the subject but in view of the discussion on Green's ferret-attenuated virus and vaccine she wondered if it would be in any way possible to explore the desirability of pressing the appropriate Ministry to allow the importation of this vaccine, at least for field trials, into this country in the present very difficult circumstances surrounding the adequate production of canine distemper prophylactics over here.

Mr. L. E. Geffen: Speaking purely as a clinician, there were two questions that he would very much like to have answered.

In the first place, what was the viability of this virus of Dr. Green's ? The present virus had to be used, according to Burroughs Wellcome, within seven days of issue. If this were true of Dr. Green's virus, would it be possible to arrange importation from America ?

Secondly, as practitioners must always keep an eye on the matter of expense of drugs, he would like to know something of the economics of Dr. Green's virus: how did it compare in price of manufacture with the one that they were now using ? Would the cost of the numerous passages involved put it beyond the means of the average client ?

Mr. A. Thomson (Beckenham) said he was extremely interested in the subject of Mr. Crawford's paper and wished to congratulate him on his excellent summary of the present position. Mr. Crawford had said that he had found no reference to the interference phenomenon occurring in diseases of bacterial origin. In this connection Mr. Thomson had wondered whether the almost immediate beneficial effects associated with the injection of certain toxoids in animal diseases might not be of this nature. He instanced the rapid clinical improvement which followed the injection of staphylococcus toxoid in cases of acute mastitis and the similar effects which had been reported when pyogenes toxoid was exhibited in cases of summer mastitis. It appeared to be true that these products had not very materially influenced the local condition, but it had been repeatedly reported that the general toxic effects were greatly alleviated. If this favourable response was due to antibody production following the injection of the antigen that response was much more rapid than one would expect. In fact, had it not been for the clinical experience these toxoids would never have been recommended as methods of treatment. In these circumstances one must wonder if an interference phenomenon was at work.

Several speakers had raised the question of importing the Green ferret-adapted distemper virus. On the face of it one would think there was no occasion to import the virus but to attempt to adapt the standard virus by ferret passage in this country. Yet, he was aware that more than one attempt to modify distemper virus had been made in Great Britain and in each case repeated serial passage in ferrets had not lowered the virulence of the virus for dogs. The question of importing this virus from America must be carefully considered because some would doubt the wisdom of permitting the importation of living distemper virus from a rabies-infected country.

The Reply

Mr. Crawford: In reply to Dr. Henderson's question regarding the mechanism by which a curative effect could be produced in distemper by the injection of a modified virus: Green envisaged natural infection as starting by the introduction into the nasal chambers of a small quantity of virus. From the point of entry the virus spread comparatively slowly from cell to cell throughout the great mass of susceptible cells in the body of the dog. While this spread was proceeding and while a great number of cells still remained uninvaded, the modified virus was introduced in a large dose and by the intramuscular route which favoured rapid absorption and dispersal throughout the body. In this way the modified virus was able to block a large proportion of the cells not already invaded by the virulent virus and so to render them impervious to attack. Thus the chance of recovery of the dog was greatly enhanced. The essential points were that the dose of the modified virus must be a large one and that it must be introduced by a route favouring rapid absorption. In reply to Mr. Fisher: the chance of the modified virus invading the cells before the virulent virus was probably favoured by the fact that in the course of adaptation of a virus the incubation period was generally shortened—sometimes, as in the case of the fixed rabies virus, very considerably—as compared with the unadapted virus. The chance was also increased by the route of inoculation favouring rapid dispersal. In reply to Miss Joshua: there should not be any insuperable difficulty in transporting Green's modified virus to this country. Freeze-drying technique would probably help. In any case there should not be any difficulty in adapting a virulent strain by passage through ferrets as had been accomplished by Green in America. Answering Mr. Geffen regarding the cost of Green's vaccine, he had no information, but on general grounds it should not be any more expensive to prepare than the biologic products at present in use in this country, and it had the advantage that neither expensive hyperimmune serum nor formolized vaccine was necessary. As for Mr. Thomson's observations regarding therapeutic effects following the use of staphylococcal toxoid in some cases of mastitis, so far as he knew the interference phenomenon had not been demonstrated in respect of bacterial infections. A bacterial intoxication was of course quite different from a bacterial infection and it might be that something of the nature of an interference phenomenon might be demonstrated between two bacterial toxins.

TENSILE STRENGTH OF CATGUT

Ever since the introduction of catgut by Lord Lister there has always been a disputation as to the best method of sterilization. Rountree,* of Sydney, has made a comparison of the tensile strength of iodine sterilized and heat-sterilized catgut sutures. The catgut used was of the plain type and came from the same source. It comprised five sizes—namely, 000, 00, 0, 1, 2.

Rountree found that there was a statistically significant loss in tensile strength as a result of sterilization of catgut by both iodine and the heat treatments investigated. The loss was greater in the heat-sterilized than in the iodine-sterilized sutures. Both types of sutures investigated are surgically adequate. There is no significant change in tensile strength of iodine-sterilized sutures during a storage period of five months. Heat-sterilized sutures behave similarly.

During sterilization and storage of both iodine and heat-treated sutures there was an increase in diameter amounting to an increase of one size in coarser sutures.—*Medical Press.*

* *Australian and New Zealand Journal of Surgery*, October, 1945.

* * * * *

FOOD AND STERILITY

Commenting on Lord Rosebery's recent statement (reported in *The Veterinary Record*) that the percentage of foals from brood mares was lower now than before the war despite the elimination of the most uncertain breeders, and that he attributed this to insufficient nourishing food, "Blythe" observes, in *The Farmer and Stock-Breeder*: "From Devon and Wales, and also from Scotland, I have recently heard of longer intervals than usual between successive calvings. This is attributed partly to the change-over to winter milk production and partly again to poor nutrition. Animals are taking longer to come in season.

"No doubt there are other causes of sterility and delayed breeding, but a complete diet comprising all of the nutritional and accessory food factors, the vitamins and minerals, such as is provided by spring grass, does, without doubt, contribute largely to animal fertility. Dried grass, silage, lucerne and clover hay, bran are also important in this connection."

* * * * *

VETERINARY EDUCATIONAL TRUST

Mr. J. A. Teakle, 57, Cedar Lawn Avenue, Barnet, has been awarded a £90 studentship by the Veterinary Educational Trust.

Cartmel (Lancashire) Agricultural Society has contributed £25 to the Trust.

* * * * *

Weekly Wisdom

Failure is not failure nor waste wasted if it sweeps away illusion and lights the road to a plan.—H. G. Wells: "The New Machiavelli."

CLINICAL COMMUNICATIONS*

Fractured Tibia in a Horse

T. L. WRIGHT, M.R.C.V.S.
PUTNEY

The specimen is the right tibia of a horse, 16 years of age, with the following case history.

HISTORY.—The animal was stabled in one of a row of stalls and was observed one morning to be in great pain with complete inability to take any weight on the off hind leg. There was a recent contused wound on the inner aspect of the limb at about the junction of the middle and upper third of the tibia. It was assumed that the injury had been inflicted by a kick from the horse in the adjacent stall. The patient was moved into a nearby loose box and put in slings.

EXAMINATION.—On examination of the injury I found that there was considerable swelling around the wound and in the hock and fetlock joints—in fact, all the typical signs of fracture except crepitus.

DIAGNOSIS.—Probably stellate fracture.

TREATMENT.—The horse was kept in slings. Chloral hydrate, one ounce, was administered and ung. hydrarg. biniod (1 : 8) was gently massaged into the seat of the injury.

COURSE: *Second day.*—Systemic disturbance had abated, but there was evidence of pain on gentle manipulation of the limb which the patient held flexed with the toe off the ground.

Fifth day.—Acute colic occurred, which was relieved by manual clearance of the rectum and the administration of chloral hydrate in bolus. The injured limb was not supporting weight. The toe was held off the ground except for very short spells.

Twenty-third day.—The hoof of the injured limb was constantly in contact with the ground but there was no appreciable support of body weight. The animal kept the hoof in the same place persistently for several days and refrained from moving the limb.

Thirtieth day.—The injured limb was bearing weight to a considerable extent. The wound had been dressed with sulphanilamide powder and had dried and healed. There was definite formation of callus at the seat of fracture, oedema of the hock had cleared completely; the fetlock joint was slightly "filled."

Thirty-sixth day.—Injured limb bearing full weight. The near hind or either of the fore limbs could be lifted without causing any discomfort in the injured limb.

Thirty-seventh day.—Patient removed from slings, walked sound to farrier's shop and had feet trimmed and reshod; returned to box sound at a walk, and lay down to rest at night.

Thirty-eighth day.—Patient had a little difficulty in rising in the morning, but got up with slight assistance and moved freely about the box all day.

Thirty-ninth day.—Early in the morning it was reported that the horse was down and appeared to be unable to rise but was not struggling. Instructions were given to leave it to rest quietly. Less than one hour later a further report was received that the leg appeared to have "gone" just above the hock. A little later, examination showed that there was complete transverse fracture at the lower end of the tibia just above the malleoli. The horse was destroyed immediately and removed to the knacker's yard The tibia was detached and boiled out.

[Presenting the specimen for inspection, Mr. WRIGHT' pointed out the callus at the seat of the original injury which appeared to be undergoing very satisfactory resolution, and he gave it as his opinion, when he saw the bone before it was boiled out, that the transverse fracture at the distal end was a very recent break and was not connected directly with the original kick. It was a very unfortunate result of the horse having difficulty in rising after its second night of freedom following five weeks in slings, and it must be remembered that the animal was 16 years of age.]

DISCUSSION

Mr. H. E. BYWATER: Those who had fairly considerable experience of horse practice would be familiar with delayed fracture of the tibia.

In such cases, when the bone was suitably prepared, one was usually able to differentiate between the primary injury and the final fracture of the bone. The primary injury might be caused by a kick or other violent blow and the complete fracture occurred at a varied period later, as a result of severe strain on the parts in the act of pulling a load, lying down, or getting up, etc.

Although the specimen did not show very distinctly the primary and complete fracture, in all probability a primary fracture of limited extent occurred at the time of the original injury.

Dr. J. MCCUNN: He believed that the fracture in the lower third of the tibia which "put paid" to the case occurred some time before actual separation took place. The opposed edges were tending to be rounded and at one spot on the posterior aspect there was a small area of polished bone which made one think that there had been movement between the fragments. Probably the terminal struggles when the horse tried to get up caused complete separation of the parts which had been held lightly together previously.

Mr. M. CRAWFORD asked Dr. McCunn for his opinion on a shallow depression on the articular surface of the distal extremity of the specimen. He then stated that depressions such as that in the specimen, only more numerous and more extensive, were a feature of the bones in cases of ostitis fibrosa. They might be present in almost any articulation, especially on the articular surface of the patella. In Ceylon, where ostitis fibrosa was at one time a common disease of horses, they had looked upon such depressions or erosions as of diagnostic value in the disease. The erosions were better seen in the cartilages of the unboiled bones.

He stated that the presence of this depression on the distal extremity of Mr. Wright's specimen suggested to him that the affected horse might have been on a diet which was on the border line of sufficiency of calcium. When the horse was injured by a kick on the tibia there was an increased demand for calcium for repair of the injury and at the same time it was probable that the horse, being kept in slings, was put on to a diet consisting largely of bran mashes and chaff. Such a diet was very deficient in calcium and contained an excess of phosphorus. It was the type of diet on which ostitis fibrosa could be produced experimentally in horses.

The combination of a bone injury and a deficient diet might, in his opinion, be the explanation of the second fracture which had occurred some 38 days after the first injury. Fractures of the long bones from trivial stresses were a feature of ostitis fibrosa.

[Mr. Crawford has since forwarded the accompanying photograph, showing erosions on the articular surface of the patella from an experimental and also from a natural case of ostitis fibrosa.]

The Reply

Mr. T. L. WRIGHT: Different opinions were expressed as to the actual time of occurrence of the transverse fracture. He held the opinion that it occurred during the early morning of the 39th day following the kick; the portion of the limb distal to the fracture was freely pendulous when first he saw it and he considered that the crepitus occurring during occasional movement during a very few hours, followed by free movement during loading and transport of the carcase, would account for the slight amount of smoothness at the fracture edges. Like Major Kirk, he wondered whether the formation of earlier callus had weakened the structure of the bone lower down its shaft.

* Communicated to the Annual General Meeting of the Central Veterinary Society ot the Conway Hall, W.C.1, October 3rd, 1946.

UNIVERSITY OF LONDON EXAMINATIONS IN VETERINARY SCIENCE

The December, 1946, Pass List relative to the above contains the names of Edwin Calvert Appleby, Rowland Brian Hill and James Arnold Toovey, all of the Royal Veterinary College, London, as having passed the Second Examination in Veterinary Science.

FIG. 1

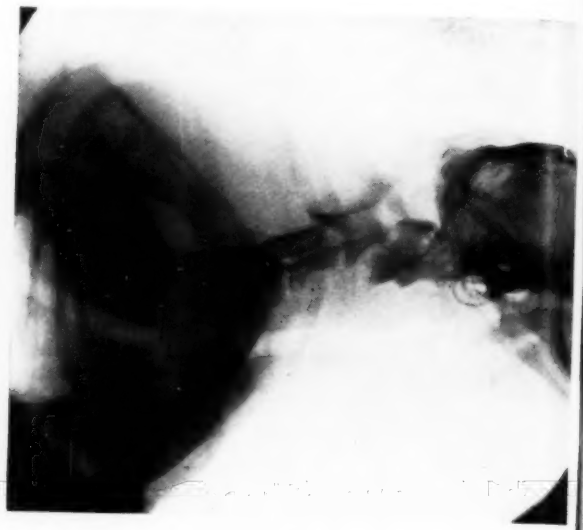

FIG. 2

FIG. 3

Cervical Fracture in a Dog, with Prospect of Recovery

T. L. WRIGHT, M.R.C.V.S.
PUTNEY

SUBJECT (exhibited).—A young dog of the Shetland Collie type, wearing a broad plaster of Paris collar, which had sustained severe cervical fracture and appeared to be making a remarkable recovery.

The pup had been brought to the surgery after having been knocked down by a motor car. It had a scalp wound, severe cerebral concussion and slight disability of the right fore limb. The owner was supplied with a mild antiseptic lotion for the wound, and instructions as to the care of the animal and advised to bring it again or request a visit if it did not soon show improvement.

Fifth day after injury. The patient was brought in. Concussion had cleared and the scalp wound was nearly healed. The animal was alert and active, but at every attempt to turn its head sideways it gave a sharp cry of pain. In all other respects it appeared to be normal. Palpation of the neck disclosed slight protuberance on the left side. Fracture was suspected and radiographs (exhibited—see Figs. 1 and 2) were taken by Dr. Warner Collins, M.D., B.SC., D.M.R.E., of Putney. They clearly revealed complete fracture of the second cervical vertebra, with considerable displacement. When I saw the extent of the injury I was amazed that, on attempting lateral flexion of the neck, the animal showed no abnormality apart from evidence of pain. I particularly wish to stress the point that, if the radiographs had been taken on the occasion of the first examination, while the animal showed signs of severe concussion, I—and, I think, many other people—would probably have considered the case hopeless and advised destruction. As the segments of fractured bone had disposed themselves in such a manner that there was no evidence of serious injury to the spinal cord, it was decided that any attempt at reduction was contra-indicated.

The patient was narcotized deeply with nembutal and a broad plaster of Paris bandage was applied in several layers round the neck. To avoid interference with breathing and swallowing, it was not possible to apply the bandage tightly. It was arranged so that the anterior border was close to the base of the ears, and the posterior border contiguous to the pre-scapular region—to lessen the possibility of "telescoping" the cervical bones and to restrict lateral movement.

Thirty-first day after injury (26th day after plaster applied). The animal, in all appearance and functions was normal, bright and active. Progress had been uneventful. A radiograph (exhibited—see Fig. 3) was obtained with the plaster collar *in situ*. This shows the bones in practically the same position as in the first picture, but the presence of the plaster collar makes it difficult to see whether callus formation is occurring.

Thirty-third day after injury. The patient, present at the meeting, was bright, active and playful and obviously quite happy.

[Mr. Wright said that he would endeavour to obtain further radiographs of this case at intervals, and report progress.]

Discussion

Dr. McCUNN: Undoubtedly this dog had sustained a fracture of the axis. The fracture was through the body near to the roof of the odontoid process. The latter was still sitting on the rung of the atlas. There was a considerable distortion of the line of the neural canal and the cord must be bent. It was remarkable that the dog was not killed in the first place and what was more remarkable was the fact that it appeared to suffer little inconvenience at the present time. There was little evidence of callus or new bone and it might be that when new bone formation did occur in the process of repair, pressure effects might become evident.

The Reply

Mr. WRIGHT: There was some discussion as to whether the lesion disclosed in the X-ray was a fracture or dislocation. He agreed with the opinion that it was fracture of the second vertebra.

AGRICULTURAL ATTACHE IN COPENHAGEN

The Ministry of Agriculture and Fisheries announces that it has been decided to appoint an Agricultural Attaché to the British Legation in Copenhagen and that Mr. Ronald Ede has been appointed to the post.

Mr. Ede has been Secretary of the University School of Agriculture at Cambridge since 1929. He was Secretary of the Luxmoore Committee on Post-war Agricultural Education which reported in 1943. He will be taking up his appointment in the spring as soon as arrangements can be made to release him from the School of Agriculture.

ABSTRACTS

[The Tonsils of the Horse. ELIAS, H. (1946.) *Amer. J. vet. Res.* **7**. 343.]

The tonsillar areas of three healthy horses were subjected to routine histological examination. The lymphoid tissue of the palate was arranged around and beneath epithelial invaginations in the form of discrete aggregated nodules with germinal centres. The surface of the epithelium between these crypts was studded with villi containing a core of connective tissue, originating from papillae of the tunica propria, and one or two capillary loops. The nature of these elevations suggested a top layer of stratum lucidum. Numerous mucous glands with independent ducts opened into the cavity of the mouth. As free erythrocytes were present in the lymphoid tissue, the palatine tonsil is classified as a haemolymph node.

The mucous membrane of the lingual tonsillar area nearest to the root of the tongue showed filiform papillae; this was continued by a zone of dome-like elevations containing salivary glands opening onto the surface of the elevations. More posteriorly the elevations became rectangular and were separated one from the other by oblong furrows or crypts; masses of lymphoid tissue were found in this zone beneath the epithelium.

In both palatine and lingual tonsils, cell groups resembling Gmelin's corpuscles were found. Another finding was concentric corpuscles like those of Hassal in the thymus. It is confirmed that necrotic cells are exfoliated into the tonsillar crypts.

C. W. O.

* * * * *

[Studies on Milk Fever in Dairy Cows. I.—The Possible Role of Vitamin D in Milk Fever. HIBBS, J. W., *et alia*. (1946.) *J. Dairy Sci.* **29**. 617-624.]

An attempt was made to find a prophylactic treatment for milk fever which would prevent the fall of blood calcium below the critical level. In a preliminary experiment six cows were fed one million units of vitamin D daily in the form of irradiated dry yeast for four weeks before parturition and one week after. Although two of the cows had previous histories of milk fever none showed symptoms. Two of the five control animals with similar histories developed milk fever. A more extensive experiment, covering 178 parturitions in Ayrshire, Guernsey, Holstein and Jersey cows, spread over four years, showed by far the highest incidence of milk fever in Jersey cows. It occurred only in cows with at least two previous parturitions, and was observed equally in summer and in winter. The yeast feeding did not prevent milk fever, but reduced the incidence somewhat in Jersey cows with histories of previous attacks. Further experiments with higher levels of vitamin D feeding are in progress.

J. O. L. K.

* * * * *

[Experiments on the Use of Home-grown Foods for Milk Production. V.—The Protein Requirements of Growing Dairy Heifers. BLAXTER, K. L., & PRICE, H. A. (1946.) *J. Agric. Sci.* **36**. 301-309.]

When the food supplies of dairy farms are limited the growing heifers are most affected, and their winter rations commonly consist of small allowances of poor hay, small quantities of mangels or kale, and large quantities of straw. Many suffer from a sub-optimal supply of Ca and P and a deficiency of vitamin A. The crude protein consumption is very low, and a calorie deficiency is possible. Experiments were carried out to show how supplies of the more nutritive foods could be released for the milking herd, without symptoms of malnutrition arising in the heifers. It was shown by references to other experiments that although protein requirements calculated by Mitchell's method were satisfactory when the foods normally available could be given, the minimal standards estimated would not give completely satisfactory growth when the bulky fibrous fodders characteristic of the war period were fed.

Sixteen dairy shorthorn heifers were used and, compared with similar animals in the herd ten years previously, were estimated to be 30 per cent. under-weight, and from eight to ten per cent. undersized. This was attributed entirely to the poor diet fed, for their bodily condition was normal and nothing clinically abnormal was noticed. Each of the four experimental rations was composed basically of poor-quality fodders with the addition of oats. The first was not supplemented, the second had half a pound of tapioca starch added, the third was supplemented with half a pound of ardein (a commercial preparation of decorticated ground-nut), and the fourth with a quarter of a pound of pure starch and a quarter of a pound of ardein. There was an initial period of five weeks during which the rate of growth of each animal was determined, then two experimental periods, one of seven weeks, and then one of five weeks using superior hay. Food refusals, mostly of straw, were noticed, making it possible to determine the maximum appetite in terms of

dry matter. Although the heifers were stunted their appetites were good, and compared favourably with the Morrison standard. When the experimental rations were given there was an immediate and rapid increase in the live weight of all the animals. Subsequently those receiving additional protein grew more rapidly than those having the basal ration alone, or the basal ration plus starch.

The final results showed that the basal ration, prepared according to minimum protein requirements by Mitchell's method, resulted in poor growth; that the addition of extra starch had no effect; and that the addition of half a pound of protein concentrate had no greater effect than the addition of a quarter of a pound of protein plus a quarter of a pound of starch. In a comparable experiment conducted before the war, growth was more rapid, showing that the high bulk oat-straw basal ration used in this experiment was unsuitable for young cattle, even when the protein deficiency was accounted for.

J. O. L. K.

REVIEW

[Gaiger & Davies' "Veterinary Pathology and Bacteriology." Third Edition: G. O. Davies, M.V.SC., M.R.C.V.S., Pp. xii + 796. (403 figs.) Baillière, Tindall & Cox, 7 & 8, Henrietta Street, London, W.C.2. Price 30s.]

There are already in the library of veterinarians a number of books which are household words within the profession. Amongst these can most certainly be included the work of "Gaiger and Davies." The third edition of this publication revised by the second of the two authors is now to hand and will surely be welcomed by veterinary students and teaching staff alike. This new and somewhat enlarged edition covers a wide field of subjects and deals with them in a simple and clear manner. The book is primarily written for the student though the specialist might well prefer to peruse his own subject—pathology, bacteriology, parasitology, etc., between its own covers. The former will not find it difficult to discover his way about and will appreciate the useful appendix relating to stains, media preparation and *post-mortem* technique. The book, moreover, is published at a reasonable price, well printed and profusely illustrated.

We would have liked to see certain sections further elaborated, but no doubt shortcomings in this respect are, at least in part, due to the fact that research has made steady progress since the book was put into the hands of the printers. For example, the section on *Corynebacteria* is not complete and some may feel that too much emphasis has been placed upon the control of contagious abortion by blood testing and segregation, as compared with the now well established method of vaccination with Strain 19. The scope of the book professes to be so comprehensive that we may be excused a sense of regret in failing to discover a section on Diseases due to Vitamin Deficiencies. There is enough information now available for this subject to be treated separately and included in the pathological section. Nevertheless we welcome this rejuvenated book to the shelves of the general veterinary reader, and in particular to the student balanced on the threshold of his fourth year.

GOODWILL AGRICULTURAL MISSION TO SOUTH AMERICA

An official goodwill agricultural mission is sailing for South America early in February. The main objects of the mission will be to strengthen friendly relations between the South American countries and the United Kingdom and foster the purchase of British pedigree livestock, more particularly dairy cattle, by certain South American countries. The mission will also explore the possibilities for export trade in agricultural machinery and other agricultural requirements and will help to spread the knowledge of Britain's agricultural achievements during the war years. The mission will be led by Sir William Gavin, Chief Agricultural Adviser to the Ministry of Agriculture and Fisheries. In the principal stock-breeding countries he will be accompanied by the following:—

Mr. and Mrs. Gerald Strutt, both past-presidents of the British Friesian Cattle Society; Lieutenant-Colonel S. E. Ashton, past-president of the Dairy Shorthorn Association and of the Shorthorn Society; Major T. K. Jeans, president-elect of the National Sheep Breeders' Association and member of the Agricultural Machinery Development Board; Mr. William Young, past-president of the Scottish National Farmers' Union, breeder of Ayrshire cattle and Border Leicester sheep; and Mr. W. P. Dodgson (secretary).

NOTES AND NEWS

Diary of Events

Jan. 25th.—Meeting of the Biochemical Society at the British Postgraduate Medical School, Ducane Road, Hammersmith, W.12, 11 a.m.

Jan. 31st.—Meeting of the Lancashire Division, N.V.M.A., at Liverpool University (Geology Lecture Theatre, Brownlow Street), 2 p.m.

Jan. 31st.—Annual General Meeting of the Royal Counties Division, N.V.M.A., at Reading (Caversham Bridge Hotel), 2.30 p.m.

Jan. 31st.—Annual General Meeting of the North of Ireland Division, N.V.M.A. (Carlton Hotel), 2.45 p.m.

Feb. 6th.—General Meeting of the Central Veterinary Society, at the Conway Hall, Red Lion Square, London, W.C.1, 2 p.m.

Feb. 7th.—Annual General Meeting of the Yorkshire Division, N.V.M.A., at Leeds (Metropole Hotel), 2.30 p.m.

Feb. 13th.—Meeting of the N.V.M.A. Parliamentary and Public Relations Committee, 36, Gordon Square, W.C.1, 11 a.m.

Feb. 26th.—Annual General Meeting of the South-Eastern Division, N.V.M.A., at Maidstone (Royal Star Hotel), 2.30 p.m.

Feb. 28th.—Special Meeting, N.V.M.A. General Purposes and Finance Committee, 36, Gordon Square, W.C.1, 10 a.m.

July 28th—Aug. 1st.—N.V.M.A. Annual Congress in Edinburgh.

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New Appointments to the Staff of the Ministry of Agriculture

As notified in recent issues, Council, N.V.M.A., has decided that no advertisements for appointments to the veterinary staff of the Animal Health Division of the Ministry of Agriculture shall be accepted for *The Veterinary Record* pending the settlement, in a manner satisfactory to the Association, of the question of the status and salaries of the Veterinary Officers of the Division.

In the meantime, any members of the profession who may, nevertheless, contemplate applying for such posts, should these be advertised elsewhere, are requested first to communicate with the General Secretary of the Association at 36, Gordon Square, London, W.C.1.

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Distemper Prophylactics

On May 4th, 1946, we intimated that representatives of the N.V.M.A. had discussed with Messrs. Burroughs Wellcome & Company the difficulties which had arisen through the shortage of distemper prophylactics, and we announced a rationing system which it was hoped would remove some of the frustrations and disappointments then existing. That scheme had been in operation since June, 1946. It appears to have been open to less objection than previous attempts to make a fair distribution of the limited supplies available to the profession.

The Association has now been informed that the production position is materially improved, but unfortunately, is not yet sufficiently good to permit supplies becoming freely available. Allocation will continue until, at the earliest, March 8th, 1947, but until then practitioners who have intimated their estimated requirements for the current period can expect them to be met in full when their allocation falls due. Those who have not intimated their requirements, or who wish to increase their estimate, may place orders with the suppliers at any time and expect them filled by the offer of material at the next convenient allocation date.

The Association intends to meet the suppliers in the near future and, while its objective will be the freeing of the supply of distemper prophylactics from any form of rationing, it may be forced through continued shortage to accept some form of allocation. The officers would, then, be pleased to receive representations and suggestions from practitioners with a view to having the current arrangements made more convenient to the profession.

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Professional Status: Remuneration of the Royal Army Veterinary Corps

In our issue of August 24th, 1946, we published, under the above heading, an editorial article protesting against the new rates of pay for officers in the Royal Army Veterinary Corps then recently announced in Parliament and in the White Paper, Command 6750, as showing an invidious distinction against the veterinary surgeon in the Army as compared with the medical man and the dental surgeon.

On the following page we reproduce correspondence on this issue

which has passed between Brigadier H. S. Mosley, D.S.O., Colonel Commandant, R.A.V.C., and the Under Secretary of State, War Office.

Park House,
Henfield, Sussex.
August 28th, 1946.

From Brig. H. S. Mosley, D.S.O., Colonel Commandant, R.A.V.C.

Dear Sir,—I have received a letter from the Military Secretary defining the duties of a Colonel Commandant and by the same post I received a copy of *The Veterinary Record* (a journal of the National Veterinary Association) in which there is an editorial article which I feel it is my duty to bring to your notice. It considers the differentiation between the pay of a Veterinary Officer and a Dental Officer during their first eleven years service as indefensible.

Further, it points out that there is not only a difference in pay of £1,022 during this period, in favour of the dental officer, but that this discrepancy is aggravated by the terms of promotion, in which the veterinary officer has to serve two years instead of one year for Captain and ten instead of eight for Major. The article includes the following passage: "These disquietening facts will strengthen the growing conviction within our ranks, that the official discrimination against the veterinary profession is not restricted to an isolated Ministry, but pervades many departments, not the least of which appears to be the Treasury.

"There is no doubt that the profession must present a firm and united front to combat the unworthy movement to lower the status of a learned profession. If we fail to obtain equitable treatment, both in the Army and civil ministries, future progress and development will undoubtedly be adversely affected to the detriment of agriculture and public health."

Apparently, the veterinary profession feels that it has a legitimate grievance; at the same time there may be reasons, unknown to the profession, why the veterinary officer is treated differently. If that is the case, may I as Colonel Commandant suggest that the representatives of the Royal College of Veterinary Surgeons be invited to meet the War Office officials at a conference, when the subject can be discussed.

May I point out that I was unaware of the revised pay and service in the R.A.V.C. until I read it in *Hansard*.

I am, Sir,
Your obedient servant,
Henry S. Mosley,
Colonel Commandant, R.A.V.C.

The Under Secretary of State,
War Office, London, S.W.1.

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(*Copy to The Director of Veterinary and Remounts Services, War Office, Droitwich*)

The War Office,
66, Eaton Square,
London, S.W.1.
November 11th, 1946.

Sir,—I am commanded by the Army Council to refer to your letter dated August 28th, 1946, and to say that the contents of the Article in *The Veterinary Record* have been noted.

The Council appreciate the motives which have prompted you to make representations on behalf of the Royal Veterinary Corps. They wish, however, to make it clear that the rates of pay carry no status implications and are based on the Government's view of the responsibilities of Veterinary Officers in relation to those of other Arms. The rates are in fact higher than the rates of combatant officers and show a considerable advance on the previously authorized.

The Council do not feel that an interview with representatives of the Royal College of Veterinary Surgeons could usefully be arranged in face of the very recent Government decision in this matter.

I am, Sir,
Your obedient servant,
G. W. Lambert.

Brigadier H. S. Mosley, D.S.O., Park House,
Henfield, Sussex.

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PERSONAL

N.V.M.A. Survey Committee Presentation to Mr. Steele-Bodger

The recognition accorded Mr. H. W. Steele-Bodger, M.R.C.V.S., of Tamworth, by the presentation to him at the 1946 Congress of the "National" of the Dalrymple-Champneys Cup for his initiative in the formation of a committee to survey the field of disease amongst livestock as a major contribution to the profession's war-time effort, and his subsequent untiring devotion to its labours, as Chairman, was most pleasingly supplemented on the occasion of the recent gathering of members in London for the meetings of Council and committees, which will be recorded in our *Supplement* at an early date.

At the first meeting of the newly-constituted Technical Development Committee its Chairman, Mr. Geo. N. Gould, on behalf of those members associated with Mr. Steele-Bodger in the work of the Survey Committee, the functions of which have now largely been transferred to the Technical Development Committee since it was laid down at the end of 1946, presented him with a handsome 200-years-old silver salver, mounted and suitably inscribed, and also bearing the signatures of all those who had contributed.

The inscription is as follows: "Presented to Harry Steele-Bodger, Chairman of the Survey Committee of the N.V.M.A. from the date of its inception in 1940 to 1946, by those of his colleagues who served on the Committee as a token of appreciation of his leadership and enthusiasm and his service to the Committee and to the Profession."

In presenting the salver "to his friend Harry Steele-Bodger," Mr. Gould said that a short time ago he had had some discussion with the Animal Health Division and with Sir Daniel Cabot in particular on the repercussions of the suggested lapsing of the Control Scheme; he felt that Mr. Steele-Bodger should know of the very high regard in which the Scheme was held by the Ministry of Agriculture and also by the National Farmers' Union. The work initiated and carried out by the Chairman and his Committee was of great importance and value and he felt certain that the results of all that had been done throughout the six years of the Committee's existence under Mr. Steele-Bodger's leadership had proved of great benefit to the profession and to the agricultural community. It had been his view for a long time that the work of the Survey Committee had been a vital factor in the progress of the profession in the war years and was carried through at a most difficult phase in the history of the profession. He hoped that the newly constituted Committee would be able to achieve the very high example which it had been set and would do all it could for the profession in all its branches.

During his period as President, continued Mr. Gould, he had talked with various members of the Survey Committee who felt that Mr. Steele-Bodger could not be allowed to leave the chairmanship without their making some tangible acknowledgment of their thanks for all he had done. In handing the salver to Mr. Steele-Bodger, Mr. Gould said: "We offer you this Georgian salver as a token of our appreciation and esteem."

Replying, Mr. Steele-Bodger said that he was not going to pretend that he knew nothing about the business—he had a hunch because several people had exhibited an unusual and persistent anxiety lest he should not be present, and he had been dragged off from his breakfast in order to be punctual! But he had not anticipated this delightful gift and once again he was almost at a loss for words to express his feelings. Members could not have given him anything which he would have appreciated more, not only for what it was, but for what it stood for. He had often said—and could not repeat it too often—that the success of the Survey Committee was due to the collective efforts of all those who had served upon it. George Gould could not possibly have a Committee whose work would give him greater pleasure and over which it was a greater pleasure to preside than the old Survey Committee; there had been a friendliness and an intimacy which he had never found in any other committee—he had loved it all. The Committee had done a lot of work and had done it well. Every veterinary surgeon and every farmer in the country had benefited by its labours. Many had criticized—and criticism was good—but most of those people now realized that a good job of work was done. But that phase had finished and with it the name of the Committee—and on sentimental grounds he was rather glad that the name had been changed. He wanted, however, to wish every success to the work of the new Technical Development Committee (of which he was himself a member). Difficulties would probably not arise under its Chairman, George Gould, and if they did they would quickly disappear.

He was, he added, greatly touched that his friends in the Animal Health Division had seen fit to subscribe to the presentation—as shown by the signatures inscribed on the back of the salver.

He would like to avail himself of that opportunity to pay his tribute to the members of his own professional staff whose loyalty and efforts during the war enabled him to devote so much time to the work of the Committee. It was true that he had devoted a vast amount of time to it and if it had not been for Mary Brancker, John Rorrison and Eric Barrett, he could not have so neglected his practice for Association work.

Again he expressed his thanks for the very kind thought—he was very touched and he appreciated it immensely. He could not have wished for any nicer gesture and it could not have been made by more decent folk. He loved old silver and he understood that

the salver was made in 1747. It was truly said that the value of good silver and good friends increased with age.

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MINISTRY INSPECTORATE CHANGES

We learn that Mr. G. Durrant, Superintending Inspector of the Ministry of Agriculture and Fisheries at Oxford, is being transferred to Edinburgh on January 31st, 1947, to take over the area vacated, on retirement, by Major D. S. Rabagliati. The change will give rise to feelings of regret in the minds of Major Rabagliati's confrères that they are to lose so kindly and helpful a colleague and in those of the members of the Editorial Committee, N.V.M.A., to which body Mr. Durrant's service as a member with wide knowledge of veterinary public health work has been of great value.

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Appointment.—Major F. W. Priestley, M.R.C.V.S., DIP. BACT. (LOND.), has been appointed Research Officer in the Sudan Veterinary Service. A year after he qualified at Edinburgh, in 1928, Mr. Priestley was appointed Research Officer in the Research Institute of Animal Pathology, whence he went to Manchester University (1934-1936) as Lecturer in Veterinary Bacteriology. In the latter year he was appointed to the staff of the Agricultural Research Council as Scientific Officer. In 1941 he joined the West Yorkshire Regiment and after a period of active service in Burma and Bengal he was transferred to the R.A.V.C. and subsequently appointed Major i/c Indian Military Veterinary Laboratories. He returned to civil life in October, 1946.

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Birth.—SPRENT.—To Muriel, wife of John Sprent, at the Chicago Lying-in Hospital, Chicago, U.S.A.—a daughter, Elizabeth.

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Marriages.—SINGLETON-STOTT.—The marriage took place at Hinde Street Methodist Church, London, on January 1st, 1947, of W. Brian Singleton, M.R.C.V.S., Darlington, to Hilda Stott, Royton, Lancashire.

WOODFORD—HINDMARCH.—The marriage took place on December 28th, 1946, at St. Botolph's Church, Bishopsgate, of Michael Henry Woodford, M.R.C.V.S., of The Hollies, New Street, Wells, to June Erica Hindmarch, of Winchester House, Old Broad Street, London, E.C.2. Mr. J. F. Henderson, M.R.C.V.S., was best man.

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R.C.V.S. OBITUARY

BAILLIE, James Richard, 98, Bonnygate, Cupar, Fifeshire. Graduated N. Edinburgh, May 23rd, 1893. Died January 14th, 1947; aged 76 years.

SLIPPER, Thomas, Ham Shaw, Brighton Road, Hassocks, Sussex. Graduated—May 17th, 1889; Fellow—May 14th, 1897. Died—January 12th, 1947.

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The Late Major T. M. Inglis, J.P., M.R.C.V.S.

AN APPRECIATION

(*Contributed*)

Scotland has lost one of its oldest, best known veterinary surgeons by the death of Major T. M. Inglis of Forfar, recorded in your issue of last week.

He commenced practice in Forfar in 1890 and was well known as an able practitioner and capable surgeon, particularly for cryptorchid operations. He held many appointments, including Ministry of Agriculture and Department of Agriculture of Scotland, for whom he examined stallions, and was also one of their oldest referees. At one time he was veterinary surgeon to Angus County Council and Forfar Town Council.

Major Inglis had served on the Council of the N.V.M.A. and was a Past President of the Scottish Metropolitan Division. He attended the last annual meeting of the Division at Perth. He demonstrated the cryptorchid operation at the Aberdeen Congress in 1924, during the absence of Sir Frederick Hobday, owing to the death of the latter's father, and did operations for him in the North of England.

Major Inglis took a great interest in local affairs and was at one time Chairman of the Parish Council and a member of the Town Council. He was the oldest Justice of the Peace for the County of Forfar. His hobby lay within the range of his interests as a veterinarian; it was, in fact, the study of grass disease, of which he reported the first case in *The Veterinary Record* in 1903. He served on many research committees concerned with this still unsolved problem. He belonged to the older generation of veterinary surgeons whose main professional interest was the horse and at lameness examinations as to soundness he was in a class by himself.

Major Inglis was a tall, handsome figure and in his prime a first-class shot. He was quietly spoken, always courteous and ready to help others.

He was twice married and leaves two daughters by his first marriage. He is survived by his second wife.

His funeral was on January 8th and was attended by the following members of the profession: Mr. J. Nisbet, with whom Major Inglis was in partnership at Forfar, Mr. J. T. Gray of Forfar, Mr. E. M. McKay of the Ministry of Agriculture and Major A. Spruell, Dundee.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

FOOT-AND-MOUTH DISEASE:

Dorset.—Vale Farm and New Inn Farm, Halstock, Yeovil (Jan. 15th); Lower Coombe Farm, Rampisham, and East Farm, Bradford Abbas, Sherborne, Dorset (Jan. 16th).

Leics.—Church Farm, Ravenstone, Coalville, Leicestershire (Jan. 16th); White House, Sinope, Coalville, Leics. (Jan. 17th).

Somerset.—Home Farm, Somerton, and Lower Farm, Podimore, Yeovil, Somerset (Jan. 15th).

SHEEP SCAB:

Lancs.—Marshaw Farm, Abbeystead, Lancaster, Lancs. (Jan. 15th).

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CASE VISITATION BY AIR

AN EARLIER "PIONEER"

Mr. C. B. Thompson, M.R.C.V.S., of Rugby (Ex-W/Cdr. G.D., R.A.F., 1939-1945) writes: "On glancing through a back number of my *Veterinary Record* I came across an article announcing that a member of the profession was visiting his clients by air, describing him as a pioneer.

"Way back in the piping days of peace—1931 to 1933 to be exact—I had a small machine of rare vintage (1924) known as a Parnall Pixie. I used to fly round a lot of my work in it, but eventually the propeller detached itself in mid-air, which hardly improved the condition of the machine, besides having several tight squeezes on occasions trying to land and take off in small fields, so I returned to the car."

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In response to representations made by the National Canine Defence League, the Commissioners of Customs and Excise state that dog-collars, harness, chains, and leads may now be regarded as exempt from purchase tax.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the N.V.M.A.

Correspondents should write as briefly as possible and letters should not exceed 350 words.

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ANAESTHESIA IN THE EQUINE

Sir,—Capt. Carey Foster's note on Equine Anaesthesia in the R.A.V.C. published in *The Veterinary Record* of January 4th, will be read with considerable interest by those in the profession who are dissatisfied with the present state of large-animal anaesthesia.

One point requires further elucidation. It is stated that 2,400 animals were anaesthetized by chloroform inhalation and in the two deaths occurring "it was found that the animals had been fed and watered the previous night and had had access to water and green fodder on the morning of the operation." Does Capt. Foster consider that an animal in a state of dehydration and possibly having depleted glycogen and protein levels in its liver is less susceptible to the toxic effects of chloroform?

Davis & Whipple demonstrated many years ago that both carbohydrate and protein protected the starved dog against chloroform poisoning, and showed that the danger of fatty infiltration and degeneration of the liver increases directly as protein stores decrease (WITTS. *Brit. med. J.* 4/1/47).

It would be enlightening to have further details of the pre-operative care given in those cases which did not succumb to the anaesthetic.

Yours faithfully,

GWENNETH W. SHOLLICK.

228, High Street,
Berkhamsted.
January 13th, 1947.